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14. ABSTRACT Aerial assets dedicated to the role of intelligence collection are today in higher demand than any other period of history. While the capability to provide support at the tactical and operational level has increased in unprecedented amounts, the capacity of support has not reached a point allowing for the discontinuation of non-optimal assets to fulfill these roles. In order to solve this current shortfall, the Department of Defense must procure sufficiently capable platforms, solve the problems facing current platforms, and repair the process tactical units are required to use to gain support.					
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MASTER OF MILITARY STUDIES

AVIATION OPERATIONS IN SUPPORT OF INTELLIGENCE COLLECTION

SUBMITTED IN PARTIAL FULFILLMENT
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The Commandant of the Marine Corps, General James F. Amos, often remarks that modern Marines are going to meet “today’s crisis, with today’s forces, today.”¹ This attitude is not unique to General Amos, and certainly not to the Marine Corps. Faced with significant reductions in budget, warfighters in every service are focused on cutting costs and operating more efficiently, but still accomplishing the mission set forth in the National Security Strategy (NSS). Despite the current fiscal environment, expensive acquisitions are necessary to meet strategic requirements, but no technology is worth more than the individual warfighter who is forward-deployed and needs support. This fact, coupled with the attitude so uniquely advocated by General Amos, has led to modification of existing technologies, often at massive expense with limited outcome, to meet the needs of the unit on the ground. One example is the use of tactical aircraft to fulfill non-traditional roles, especially in conducting intelligence, surveillance, and reconnaissance (ISR) operations. This application of existing technology to meet a capacity shortfall fills a tactical need but at significant cost. The procurement of greater numbers of ISR-capable platforms has increased dramatically, notably the acquisition of great numbers of unmanned aerial systems (UAS). Despite the additional capacity these recently acquired systems bring, the demand for imagery intelligence at the tactical level has not been satisfied.

An alternative to the application of existing technology to meet non-optimal mission areas is to analyze the mission requirements and invest in the proper tools to perform the mission. In the case of manned mission areas of aviation, the doctrine, application, and procurement cycles are long standing and well-established. Newer technologies employing the latest technological advancements do not always enjoy the same solid foundation and as a result, both time and money can be spent on programs unable to fulfill the needs of the warfighter. Procurement and employment of UAS is a visible and controversial topic for both the services

and the public as well. According to the GAO's report on ISR 11-465, "ISR systems have proved critical to the combatant commanders to plan and execute military operations in Iraq and Afghanistan by providing them timely and accurate information on adversaries' capabilities and vulnerabilities. The success of ISR systems in collecting, processing, and disseminating useful intelligence information has fueled growing demand for more ISR support, and the Department of Defense (DOD) has increased its investments in ISR capabilities significantly since 2002."²

During Operations DESERT SHIELD and DESERT STORM the USAF had insufficient aircraft dedicated to locating SCUD missiles. The solution to this problem was to use tactical aircraft equipped with optical targeting equipment to assist in the effort. After completing their primary strike missions, these aircraft spent their remaining loiter time searching for the missiles hidden in the Iraqi desert. While of very limited outcome, this tactical capability significantly augmented the three squadrons dedicated to the effort.³ This use of aircraft to augment the tasked squadrons was beneficial from a cost/benefit perspective. The aircraft used were already in the area of operations and did not incur significant additional cost in executing their secondary missions. This use of multi-role aircraft was repeated during OPERATION ENDURING FREEDOM (OEF) and OPERATION IRAQI FREEDOM (OIF). Unfortunately the use of these platforms to fulfill a largely tactical need has caused significant accelerations in the utilization rates of tactical platforms across the board, resulting in a significant loss of capability and readiness for today's US military.⁴

The US military uses multiple aviation platforms to conduct surveillance and reconnaissance operations. They range in size and capability from very large, multi-crew, multi-spectrum aircraft such as the Joint Surveillance Target Attack Radar System (JSTARS) to the unmanned, daytime-video-only RQ-11 Raven. This paper will focus on systems currently in use

to collect intelligence at the tactical level and will not touch on the larger systems which have a greater use in the strategic efforts of the US. Largely this paper will contrast manned and unmanned aviation systems but will focus the discussion on the aspects of tactical intelligence efforts these platforms support. What are “tactical intelligence efforts of aviation?” Per Joint Publication (JP) 2-0, intelligence is defined as “[t]he product resulting from the collection, processing, integration, evaluation, analysis, and interpretation of available information concerning foreign nations, hostile or potentially hostile forces or elements, or areas of actual or potential operations.”⁵ Aviation operations at the tactical level support intelligence efforts with a focus on smaller areas and typically use sensors similar to those used for targeting. Traditionally, intelligence operations have focused on the enemy and the environment, and not on friendly forces. For this discussion the distinction will be blurred at times, particularly when discussing operations such as “armed overwatch” or “convoy escort”. While those missions are not typically considered intelligence operations, the use of airborne surveillance assets in their conduct causes these missions to fall within the topical discussion area of this thesis.

“Tell me what you know ... tell me what you don’t know ... tell me what you think — always distinguish which is which.” Colin Powell, JP 2-0

To assess the needs of current forces, the mission of both intelligence sections and supporting aviation units should be identified. According to the JP 2-0, “The primary function of joint intelligence is to provide information and assessments to facilitate accomplishment of the mission.”⁶ The primary function for an intelligence effort at the tactical level mirrors that of joint intelligence. Applied at the tactical level, the mission of any intelligence section is to maximize available assets in order to produce actionable intelligence for the commander and accomplish the objectives of higher command while supporting the efforts of adjacent commands as required. Task organization at the tactical level (battalion) reveals both the US Army and the US

Marine Corps operate with a low manning level in the intelligence section.⁷ As such, the commander has significant involvement in the intelligence cycle. Other staff sections also assist in the cycle, notably the party responsible for air support, the Tactical Air Control Party (TACP). This task organization of the tactical unit allows for two separate methods to initiate collection efforts. While the intelligence section forwards its request for inclusion in its higher command's collection deck and these requests are reviewed and forwarded by subsequent higher command levels, the Air Officer or Joint Terminal Attack Controller can submit Air Support Requests (ASR) to the air component, typically the Joint Air Operations Center (JAOC). The ASR process results in fixed-wing tactical aviation units assigned to ISR roles. Alternatively, dedicated ISR platforms are assigned their missions as a result of a joint effort between a dual operations-intelligence staff. Problems arise if the members of the intelligence staff at the joint level apportion their resources with an overly strategic focus, leaving the warfighters at the tactical level with little or no dedicated ISR support.

JP 3-30, the Joint Publication for Command and Control of Air Operations does not lay out a specific mission for tactical aviation units. It does task the Joint Forces Air Component Commander (JFACC) with developing "a joint air operations plan to best support the joint force commander's concept of operation."⁸ Further, it directs the JFACC to accomplish various mission areas including close air support and airborne intelligence, surveillance, and reconnaissance. In the beginning of any conflict, the focus of aviation operations is generally more on kinetic employment and less on intelligence collection efforts. These initial kinetic events would be impossible without large amounts of collection and analysis at strategic levels. As the enemy's warfighting capability is diminished, the conflict will become increasingly precise and opportunities to destroy war material from aviation platforms decrease.

This decrease in enemy capability causes the focus of aviation operations to shift from kinetic operations to intelligence-focused operations with an armed-response capability. As this shift occurs and the conflict lengthens, it is of the utmost importance to arrive at a proper balance between kinetic operations and intelligence operations. Within counter-insurgency (COIN), kinetic operations pose as much risk to the employing forces as they do to the insurgents. Too often, a strike on a known enemy position can change from a victory for the conventional forces to a victory for the insurgents through a simple information operation. The fight in Iraq and Afghanistan provide plentiful examples of this. Despite a reduced role in kinetic operations, tactical aircraft remain in theater and are still used routinely. These aircraft not only provide armed response missions, such as aerial escort, strike coordination and reconnaissance, and close air support, but they have also been asked to fill the more non-traditional role of TACAIR – ISR.

The first question when analyzing the needs of tactical units is “what tasks must be performed to accomplish the mission?” Typically these are specified, implied, or essential tasks. The six categories of intelligence operations are: planning and direction; collection; processing and exploitation; analysis and production; dissemination and integration; and evaluation and feedback. Some of these categories are specified by the commander, while others are implied in the intelligence process. Planning and direction operations reveal resource requirements necessary to the accomplishment of intelligence objectives. These requirements are met by a variety of sources. Within COIN operations, Human Intelligence (HUMINT) and Signals Intelligence (SIGINT) are typically the first resources to indicate enemy activity.⁹ Following these indications, the intelligence section will attempt to verify the information presented prior to enacting operations based on it. This verification can be performed by any platform capable of providing Imagery Intelligence (IMINT) in the visible or near visible spectrum. This mission is

fulfilled by both dedicated surveillance platforms and also by tactical platforms using weapons targeting pods.

Joint Publication 2-0 states “All staff sections may recommend intelligence requirements for designation as priority intelligence requirements (PIRs) – a priority for intelligence support that the commander and staff need.”¹⁰ The intelligence section uses PIRs to provide focused intelligence efforts resulting in sufficient qualified information for action without overwhelming the section’s ability to analyze the incoming data. The purpose of these efforts is to allow the commander “to identify adversary critical vulnerabilities, centers of gravity (COGs), and critical nodes for the optimum application of all available resources.”¹¹ These PIRs may be temporary, lasting only a few hours, or long-lasting and persistent. Persistent requirements for surveillance present a significant problem for tactical commanders. The frequency of support from capable ISR platforms is generally too poor to be counted on especially for dynamic targets.¹² As a result, commanders resort to other means of gathering intelligence on the PIR. This is typical of the cause of increased requests for tactical aviation units to perform NTISR. Often the ground unit has great familiarity with its area of operations (AO), but the operators of the platforms providing IMINT are less familiar. This unfamiliarity causes friction, though this friction can generally be overcome by repeated operations in the same area and clear communications between the requestor and the collector.

Intelligence operations are limited by the commander’s requirements, the intelligence section’s capacity to collate and analyze the information collected, systems available for tasking, and the capability of collection platforms. Additionally, support is only provided if the requesting unit is able to make timely requests. This operational limitation is exacerbated by the high demand ISR systems suffer. Generally, requests for national-asset level imagery require

long lead times. The current method of requesting manned platforms to provide IMINT requires input 96 hours from the time the request is made before an asset can be provided. The four-day planning cycle of the joint air component provides a very efficient centralized control of operations by the JFACC, but it is not generally responsive to immediate requests for collection. There are currently strategies to support more flexible tasking by utilizing “on-demand ISR”.¹³ These “on-demand ISR” strategies are an off-shoot of the surge operations of 2007, when the Air Tasking Order (ATO) was written to provide multiple sorties per day to execute on-call Close Air Support (XCAS). Often these missions were written to provide availability to ground commanders for on-demand NTISR as well as XCAS. While this concept proved useful for a flexible response, it failed to address another issue: unfamiliarity of the requesting unit with some of the collecting platforms. Because of the variety of platforms assigned to perform XCAS missions, there was significantly differing outputs from the systems producing IMINT. The data from these platforms was not always useful to the supported unit.

There are limitations of the collecting platforms as well. The first limitation is budgetary, and tactical aircraft are great consumers of both operating and acquisition budgets. For example, the F-18 and F-15 operating and maintenance costs range between \$30,000 and \$40,000 per flight hour and each airframe cost more than \$30 million when they were produced.¹⁴ Neither platform has particularly long loiter time without needing additional fuel. Typically, these aircraft operate as a pair, which can be a force-enabler, but also doubles the cost of NTISR operations. Each of these platforms utilizes Remote Operated Video Enhanced Receiver (ROVER) system to transmit live video imagery to a receiver on the ground. There is no video playback capability in the aircraft. Each aircraft has a sensor capable of detecting images in the visible and near-visible spectrum, but this capability is limited. Neither of these aircraft is

particularly efficient regarding fuel consumption, though each has improved consumption rates at higher altitudes. Unfortunately, the trade-off of higher altitude is decreased sensor performance. As a primary role, ISR is only a marginally successful mission area for either aircraft.

A reasonable alternative for collecting seems to be the UAS flown by all of the services. These are divided into several different types. Operating at slower speeds and nearer the ground are the Small UAS such as the RQ-11 Raven considered to be Group 1. These are largely man-portable and have very limited range and loiter time. Generally Group 1 systems are used by small, squad-sized units for tactical purposes. Slightly greater capabilities in speed and payload define the UAS known as Group 2. Currently the DOD is developing and fielding the RQ-21 Integrator, a Group 2 UAS to be operated by the US Navy and Marine Corps. Group 1 and 2 UASs are typically controlled through radio inputs over the ultra-high frequency (UHF) spectrum and within line-of-sight (LOS) of the controller.

Group 3 UAS are typified by the RQ-7 Shadow, operated by both the US Army and the USMC. Compared to manned aircraft of similar capabilities, these systems are cheap to procure and operate. Aeroweb industries notes, “A full RQ-7 system with 4 UAVs, launcher, ground control station, and associated spares and other equipment has a price tag of about \$15.5 million (in 2011). The unit cost (just the aerial vehicle) is \$750,000 (in 2011).”¹⁵ Operations for these systems is not generally measured in dollars per flight hour, but the overall commitment the Marine Corps made in Fiscal Year (FY) 2011 was just over \$50 million for procurement and research and development. The FY 2013 commitment is a planned \$57 million. The Marine Corps currently operates about 50 of the aircraft with the US Army operating about 450. While cheap to procure and operate, the Shadow does suffer significant limitations. The basic Shadow

has a flight endurance of just over four hours with no capability to perform aerial refueling. Following its upgrade to the RQ-7B model, endurance increases to give a capability of about 8 hours on station. Both the basic and upgraded models are relatively slow, cruising at about 70 knots, and are limited by a low operating ceiling of 15,000 feet. The on-board sensor is a relative strength, allowing routine operations around 6000 feet. The aircraft engine is notorious for unreliability and there is no reliable fuel sensing system, which causes the operators to return the asset to base earlier than required. The Shadow is controlled by a LOS system in the UHF band and is vulnerable to interference by jamming efforts in this spectrum. This LOS control system is a significant handicap, often preventing the operator from initiating a descent which would provide the sensor with greater clarity. The final negative of the Shadow UAS is its very large operational footprint. Despite having lesser requirements for support than tactical aviation units, each Shadow unit has in its inventory ten associated ground vehicles and trailer-mounted support equipment as well as the Ground Control Stations (GCS) required for operations. In order to give its Shadow units an increased capability for expeditionary deployment, the USMC is outfitting its VMUs with the RQ-21 Integrator which is more adaptable to launch and recover while embarked onboard amphibious shipping.

The next level of capability is the Group 4 UAS and typical of this classification is the MQ-1 Predator. A larger platform than the Shadow, the Predator and its variants also have a greater logistical requirement. They are also slow, cruising at about 70 knots, have a relatively low service ceiling, 25,000 feet, but are considerably more expensive, and the more heavily armed variant, the MQ-9 Reaper, even more so. The US Navy, US Army, US Air Force and the Central Intelligence Agency each operate the Predator and the cost for a complete unit is about \$20 million. The complete unit “includes four aircraft, a ground control station and a Predator

Primary Satellite Link.”¹⁶ Unlike the Shadow, the Predator is capable of carrying a limited loadout of 2 Hellfire missiles. Group 4 UAS operations are similar to those of tactical aviation units, requiring a long runway or some other unobstructed improved surface to launch and recover from and improved facilities for control and maintenance operations. Determining the operational cost of Predator, and of its more heavily armed cousin, the Reaper, is difficult because it is funded by more than just the DOD budget. In the US inventory are a small number of Group 5 UAS as well, typified by the Global Hawk. These systems are considered national assets and are not included in this discussion of intelligence support at the tactical and operational level.

The final question in analyzing the needs of the tactical unit is what forces are needed to accomplish the mission. JP 2-0 states “[d]uring campaign planning, strategic and operational intelligence operations focus on providing to the Joint Force Commander information required to identify the adversary’s COGs, COAs, and high value targets (HVTs). During execution, operational intelligence operations provide the JFC with relevant, timely, and accurate intelligence relating to the accomplishment of campaign or major operation objectives.”¹⁷ The tactical commander has similar requirements, though on a smaller scale. The JFACC will apportion his capable forces to enable the JFC to accomplish the above tasks. Because of capacity issues previously mentioned, this is not always successful in meeting tactical intelligence requirements. Many, if not most, of the tactical ground units in Afghanistan today are equipped with some sort of organic ISR capability. Sometimes it is in the form of truck-mounted cameras, sometimes it is a Group 1 UAS.

These ISR capabilities are relatively recent and doctrine on employment is lacking. In order to uncover the information a unit needs to operate, the ground commander initiates the

intelligence cycle and the intelligence section begins to make requests. Requests for full motion video (FMV) or IMINT from national assets often go unfulfilled in time or duration. Different agencies, to include some outside the DOD, have assets stationed in theater. These assets are often available to the JFACC as well, albeit in a limited availability. During OIF the JFACC used a method known as “peanut butter spreading”¹⁸ to provide some amount of support to a majority of requests. This process gave as some amount of support to as many requestors as possible. Generally, requests were not met for their full duration. In the absence of a purpose-built ISR platform, many of these requests were fulfilled by tactical aircraft with the requirement of persistence also unmet. Additionally, planners have failed to capitalize on certain aspects of ATO development which would facilitate better coordination between manned and unmanned operations.¹⁹ Somehow the JFACC is failing to provide the forces required for the ground commander to achieve the desired effect of intelligence operations.

What must supporting forces do and what things must these forces not do in fulfilling the tactical intelligence and operational requirements of commanders? These assets must be in the proper location to collect the requested intelligence data. They must have the capability to transmit this data in the time frame noted by the requestor. They must also stay overhead the target long enough to satisfy the desires of the requestor. This time requirement can be used to divide intelligence targets into categories which require persistence or do not. The definition of persistent surveillance is more focused on presence than may be useful to commanders in the current fight. Due to limitations on the number and capabilities of current systems, it is more useful to discuss persistence in the terms of persistent ISR as proposed by the Commander’s Handbook for Persistent Surveillance. From this publication, persistent ISR is described as an “ISR strategy to achieve surveillance of a priority target that is constant or of sufficient duration

and frequency to provide the joint force commander information to act in a timely manner.”²⁰

This definition of persistent ISR is more applicable than the definition of persistent surveillance because it gives forth the option to use frequent or periodic examinations of the intelligence target without necessarily requiring continuous presence. This opens up the possibility of fulfilling the task with a greater variety of assets. This mindset is important to aviation operations because of the variety of capabilities each platform has regarding on-station time.

Intelligence support dictates whichever platform provides imagery to the requestor is flexible in response. The current method of using either the ROVER system in the case of NTISR platforms or an internet-based viewing program in the case of UAS support is not established to provide flexibility to the viewer. Often the warfighter is unfamiliar with the viewpoint of the surveillance platform or the information presented on the video feed. To ensure collection of the proper target, the viewer must be capable of communicating to the operator where the focus of the FMV should be. In the case of ROVER equipped systems, the image presented in the cockpit does not always match what is transmitted to the ground receiver. In other words, if the viewer asks the operator to move the picture “up”, it may result in an apparent lateral move instead. This is less of a concern with UAS since the internet-based video feed generally matches what the operator views. Difficulty in communications often occurs due to a lack of direct contact between the operator and the warfighter, especially as communications are often stove-piped between authorities within and outside of the theater of conflict.

A solution to the flexibility issues is to require all systems which transmit FMV to adhere to a mutually agreed upon display template allowing the commander on the ground to see the same picture regardless of the platform providing the service. Similarly, the ground-viewing station should allow the requestor to center the search through either a hand-held monitoring

device or to input the search centroid via a computer on the internet-based viewing model. This would bring surveillance procedures more in line with current close-air support procedures and allow existing procedures to bolster new technology. An added requirement of this concept would be a capability for the surveillance platform to autonomously program an orbit satisfying the search profile the warfighter desires. Finally, whatever system is being used should allow the requestor to communicate with the operator directly, without requiring an intermediary.

With the exception of the Reaper and the armed Predator aircraft, UAS aircraft do not have an armed response capability. Both the US Army and Marine Corps invested heavily in research and development to address these issues. Despite their investment, both services reached a similar conclusion, namely, arming current systems does not produce enough effect to be worth the cost. This seems to result from the limits of the airframe. In order for the UAS platform to be airborne long enough to provide persistent ISR, it must be lightweight and have low drag. Adding ordnance increases drag, thereby requiring increased power, leading to greater fuel consumption and decreased time-on-station. Less time-on-station coupled with longer transit times due to low operating speeds means the armed Shadow UAS is little better than tactical aircraft performing the same mission.

Is the armed response requirement a key requirement for a dedicated ISR platform? According to the current concept of joint air operations, the answer seems to be no. Within JP 3-30, the JAOC Director is given responsibility to oversee seven functional areas: Strategy, Combat Plans, Combat Operations, ISR, Air Mobility, Specialty and Support Teams, and Personnel Recovery Coordination Centers. Specifically separating ISR from combat operations is a handicap to mission effectiveness. The current mantra among the ISR community is “find, fix, target, track, engage, assess (F2T2EA).”²¹ This is an encouraging slogan but unrealistic

considering the very limited capability UAVs have to kinetically address a target. As long as ISR remains doctrinally separated from Combat Operations, the F2T2EA will continue to be a partial solution. Finding the enemy without the ability to address him kinetically will continue to delay the cycle and put warfighters at risk.

Another cause of the JFACCs failure to support may be related to the division of mission areas within the joint structure. Just as some tactical aircraft can fulfill ISR roles, so too can some ISR aircraft fulfill combat roles. This is good. The point of making multi-role aircraft is to give the commander more options with fewer forces. Separating ISR from combat operations causes significant delays in prosecuting targets. As long as an aircraft capable of armed response is near, then this problem can be easily solved. Without one, those watching the feed must continue to track the target until a ground unit can respond. If ISR were a function of Combat Operations, it would more easily fold into the strategy of the air campaign in a given theater. One solution would involve pairing ISR scheduling within areas of frequent enemy activity with an armed response option in the form of airborne alerts or alert aircraft ready to launch.

Mirroring the separation between ISR and other aviation functions under the JFACC's control, the process of tasking ISR is also separate. Some of this is due to the organic nature of Group 3 UAS in the US Army and USMC. Currently in Afghanistan, the intelligence section of ISAF endorses the PIR's down to the battalion level.²² The production of a tasking document to fulfill ISR needs comes out in the same media as the ATO used for Combat Operations. Often there is not enough coordination between the products to allow for unencumbered operation of both tasks without handicapping the other. As noted previously, the Shadow UAS is the percentage system used by both US Army and USMC. It is vulnerable to disruptions in service due to Electronic Warfare (EW) actions as well as altitude restrictions. If a route is targeted for

EW while simultaneously targeted for ISR, the result could be a loss of an aircraft but also the loss of the intelligence the Shadow would have collected. When considering the impact of the UAS which operate at higher altitudes, the potential for midair collision becomes much greater. Due to the lag induced by their “Beyond Line of Sight” (BLOS) control systems and their lack of maneuverability, the Predator and the Reaper present a significant airborne threat to other aircraft. Producing parallel documents for simultaneous airspace utilization requires more coordination during execution and could be minimized if the planning process for airspace utilization were consolidated into one process.

Given the previously stated constraints and restraints of aviation operations in support of intelligence efforts, what COA should the joint force adopt? Certainly, there is real need for an increased capacity for ISR in the aviation community. Multiple programs of record (POR) exist to demonstrate this. Few of these POR are specific to UAS, and even fewer to manned systems dedicated for ISR efforts. But there has been a substantial increase in the number of UAS the DOD operates. DOD is addressing the substantial increase in UAS technology with considerable goals of streamlining costs and eliminating redundancies. Each of the services has produced some form of document detailing its plan to incorporate UAS and other autonomous and semiautonomous systems into their future operational concept. DOD has attempted to collate these concepts into one unifying document, the *Unmanned Systems Integrated Roadmap 2011-2036*, and has produced guidelines for defining the technology and continuing development. Interoperability is a key concept as is autonomy, airspace integration, communications, training, power plants, and manned and unmanned teaming. Not contained is any discussion of doctrinal development and inclusion of UAS within the current or future joint employment concept. The individual services address the roles and key tasks UAS will fulfill but inclusion into the current

concept of aviation is nebulous. This is a result of the current construct whereby UAS within the US Army and USMC are viewed as a tool of the intelligence sections of each service and not under the authority of the aviation branch of each service. If the warfighter is to have the opportunity to take full advantage of multi-role UAS as he can with tactical aircraft now, then the aviation branches of both the US Army and USMC should have control of both tactical and doctrinal development of ISR mission areas.

The best solution to providing appropriate amounts of tactical and operational intelligence support will be one which approaches the problem with a holistic focus. Returning UAS exclusively to the aviation communities within each service will ultimately yield a platform capable of accomplishing the requirements of the mission of intelligence. When UAS falls under the regular authority of aviation, existing doctrine for mission areas the systems will perform can be applied. Tactics, techniques, and procedures will remain specific to each UAV, but employment of the asset within the aviation structure will be best developed with the input of the other aircraft which operate in the same environment performing the same tasks. Once these programs become an equal partner in the aviation community, the perception will change and more service members will see the potential each system has. Ultimately, the customer asking for aviation support shouldn't care what platform provides the service, but should be focused on the end result of the request. These requests show the requirements of each task the ground commanders need aviation assets to perform. These requirements will drive development.

In order to determine the best platform to provide tactical and operation intelligence support to the warfighter one must examine the key tasks the program must perform. For ISR, the aircraft should be capable of long loiter times. It must be capable of detecting and collecting data across multiple spectra. It must be survivable, efficient, flexible and stealthy – in noise

signature and radar signature. It must be interoperable with other aircraft in the area of operations. It should have the ability to transmit its data to the customer in a timely manner. Requirements for aviation support of kinetic operations include capable sensors, survivability, flexibility, and scalability. In other words, proper support requires an aircraft capable of detecting the target and carrying the appropriate munitions, employing its ordnance, and doing so without loss of either operator or aircraft. The use of UAS for intelligence purposes has many advantages over manned systems. The first advantage is operator survivability. If the UAS platform comes under attack, the operator is not at risk of bodily harm. Secondly, without an operator on-board, the aircraft will be designed without the added weight of life support systems resulting in reduced power requirements and lower fuel consumption. Reduced power requirements allow smaller aircraft engines to be used which can lead to increased efficiency and longer periods of on-station time. Smaller engines operate at a reduced decibel level, assisting the UAS platform in being difficult to detect. Their small size also allows for a small radar cross section, making them difficult to detect by adversary radar systems. These benefits must be contained within the next generation of UAS if they are to continue their advantages over manned aircraft.

UAS also have some disadvantages. The small tactical UAS of Group 1 have extremely short range and flight duration. The larger Shadow systems suffer from reliability issues and are limited in operating through the weather. Within the current inventory are few UAS equipped with an on-board radar capable of detecting other airborne aircraft. This lack of ability is a handicap in the development of systems intended to have a “sense and avoid” capability. The addition of radar will cause an increase in weight, requiring more power. These aircraft also suffer from low speeds and low maneuverability. They have no mid-air refueling capability.

While these disadvantages may seem easily overcome by proper planning, their disadvantages limit the full use of UAS in the overall air campaign of a conflict. A ground commander would likely find the single greatest disadvantage of UAS is their lack of ordnance. An aviator may provide a different opinion of limitations of UAS. The single greatest problem of UAS is not its dissimilarity from the capabilities of manned aircraft, but the perception that all UAS are limited in capability when compared to manned systems. In both OIF and OEF, the use of UAS as the primary source for tactical surveillance only became the norm after the manned assets became much more limited in availability.²³ In other words, the ground commanders weren't getting the necessary support from Shadow and Predator units due to the request process or some lack of capability which prevented the asset from being used in the commander's concept of operations.

To remedy this, the services must first look at their perception of UAS. These systems were designed to take up the load for manned systems in order to accomplish their tasks at reduced risk, less cost, or with greater regularity. As one VMU squadron commanding officer puts it, "The real purpose of UAS is to do the 'dirty, dangerous and dull' missions that take service life off the manned platforms and waste valuable time and manpower."²⁴ If UAS scheduling and employment were better coordinated with Combat Operations then a path could be opened to allow for more effective employment of both manned and unmanned systems in a complementary manner. The intelligence section is properly authorized to recommend targets for collection. This is where their authority should stop. Under the current construct they are then permitted to become entrenched in the scheduling process of their "organic" tactical UAS support and only when the capacity shortfall is reached do they reach out to the aviation operations section to fill intelligence requirements. The intelligence section's involvement with collecting platforms should be limited to identifying, validating, and prioritizing collection

targets. The operations sections should be focused on scheduling and conducting operations. When problems arise, liaison between the intelligence section and the operations section should provide a solution. If there are significant problems, assignment of an intelligence representative to the operations section to serve as a direct liaison could solve most.













The next perception problem to overcome is the limited nature of UAS in intelligence operations. Currently, their capability has limited the tasks of UAS almost exclusively to collection of FMV. With the proper equipment and modified properly, UAS will be capable of performing every task and mission area which manned aircraft currently perform. This means utility as collectors of geospatial intelligence (GEOINT), measurement and signals intelligence (MASINT), SIGINT, as well as IMINT. They will also be capable of taking on more “combat operations” as their capabilities increase. Intelligence operations must be folded into the broader area of “combat operations” the CFACC is tasked with conducting. A truly multi-purpose UAS will be capable of conducting ISR activities while simultaneously providing aviation support for many other areas. With the right equipment, the UAS can act as a radio relay, network hub, refueling platform, command and control hub, armed-response platform, EW platform, even assault support. The key requirement is for the services to push for UAS capabilities which mirror those of manned platforms and analyze UAS programs to uncover unfulfilled requirements and unutilized capabilities. This may require shifting budgetary priorities away from procurement of manned systems. In the long run, this change in budget priority will show its value as it puts fewer people in harm’s way.

In the future, budget concerns will cause developing programs to be reduced, or even eliminated. Some of these reductions will have limited impact, while others will have long-reaching, strategic connotations regarding capability and capacity of the joint force. Each

developing program has some degree of interoperability built in. From the US Navy's latest Littoral Combat Ship, to the US Army's program to develop the Current Operational Picture, to the US Air Force's replacement tanker program, every program has some capability to network with other systems. Aviation is no different. Perhaps the single most expensive fighter-attack aircraft in history, the F-35 Lightning is packed with all of the capabilities expected of a fifth generation multi-role fighter, but its greatest strength may be in its enabling of other systems to communicate. The capability of dedicated platforms to perform intelligence tasks should be no different. Manned or unmanned, the platform must meet the requirements of the mission, both in capability but also in capacity.

Appendix

Unmanned Aircraft System Classifications and Characteristics*

DoD Unmanned Aircraft Systems (As of 1 JULY 2011)					
General Groupings	Depiction	Name	(Vehicles/GCS)	Capability/Mission	Command Level
Group 5 • > 1320 lbs • > FL180		•USAF/USN RQ-4A Global Hawk/BAMS-D Block 10 •USAF RQ-4B Global Hawk Block 20/30 •USAF RQ-4B Global Hawk Block 40	•9/3 •20/6 •5/2	•ISR/MDA (USN) •ISR •ISR/BMC	•JFACC/AOC-Theater •JFACC/AOC-Theater •JFACC/AOC-Theater
		•USAF MQ-9 Reaper	•73/85* *MQ-1/MQ-9 same GCS	•ISR/RSTA/EW/ STRIKE/FP	•JFACC/AOC- Support Corps, Div, Brig, SOF
Group 4 • > 1320 lbs • < FL180		•USAF MQ-1B Predator	•165/85*	•ISR/RSTA/STRIKE/FP	•JFACC/AOC-Support Corps, Div, Brig
		•USA MQ-1 Warrior/MQ-1C Gray Eagle	•31/11	•(MQ-1C Only-C3/LG)	•NA
		•USN UCAS- CVN Demo	•2/0	•Demonstration Only	•NA
		•USN MQ-8B Fire Scout VTUAV	•14/8	•ISR/RSTA/ASW/ ASUW/MIW/OMCM/ EOD/FP	•Fleet/Ship
Group 3 • < 1320 lbs • < FL180 • < 250 knots		•USA MQ-5 Hunter	•45/21	•ISR/RSTA/BDA	•Corps, Div, Brig
		•USA/USMC/SOCOM RQ-7 Shadow	•368/265	•ISR/RSTA/BDA	•Brigade Combat Team
		•USN/USMC STUAS	•0/0	•Demonstration	•Small Unit
Group 2 • 21-55 lbs • < 3500 AGL • < 250 knots		•USN/SOCOM/USMC RQ-21A ScanEagle	•122/13	•ISR/RSTA/FORCE PROT	•Small Unit/Ship
Group 1 • 0-20 lbs • < 1200 AGL • < 100 knots		•USA / USN / USMC / SOCOM RQ-11 Raven	•5628/3752	•ISR/RSTA	•Small Unit
		•USMC/ SOCOM Wasp	•540/270	•ISR/RSTA	•Small Unit
		•SOCOM SUAS AECV Puma	•372/124	•ISR/RSTA	•Small Unit
		•USA gMAV / USN T-Hawk	•270/135	•ISR/RSTA/EOD	•Small Unit

*Reproduced from *Unmanned Systems Integrated Roadmap FY2011-2036*, U.S. Department of Defense.

Notes

¹William T. Eliason, "An Interview with James F. Amos," *Joint Forces Quarterly*, <http://www.ndu.edu/press/interview-amos.html>, January 2012.

²U.S. Government Accountability Office, *Intelligence, Surveillance, and Reconnaissance: Actions Are Needed to Increase Integration and Efficiencies of DOD's ISR Enterprise*. (Washington, D.C.: Government Accountability Office, 2011), 1.

³Stewart M. Powell, "Scud War, Round Two," *Air Force Magazine*. Vol. 75 No. 2. <http://www.airforce-magazine.com/MagazineArchive/Pages/1992/April%201992/0492scud.aspx>

⁴This information is courtesy of LtCol Phillip Williams (USMC) and Maj William Maples (USMC) and is contained in unpublished working projections conducted periodically by Headquarters Marine Corps, Aviation Plans and Policy 31, TACAIR Integration.

⁵U.S. Department of Defense, *Joint Intelligence*. JP 2-0 (Washington D.C.: Joint Staff, 22 June 2007), GL-11.

⁶*Ibid*, I-3.

⁷Headquarters U.S. Marine Corps, *Organization of Marine Corps Forces*. MCRP 5-12D (Washington D.C.: Headquarters U.S. Marine Corps, 11 October 1998).

⁸U.S. Department of Defense, *Command and Control for Joint Air Operations*. JP 3-30 (Washington D.C.: Joint Staff, 05 June 2003), II-3.

⁹U.S. Department of Defense, *Joint Intelligence*. JP 2-0 (Washington D.C.: Joint Staff, 22 June 2007)

¹⁰*Ibid*, I-8.

¹¹*Ibid*, I-21.

¹²Michael Grunwald, "Transforming Air Force ISR for the Long War and Beyond." (Maxwell Air Force Base, AL: Air University Press, 2009)

¹³This adjustment for ISR tasking and CFACC apportionment is well discussed in Michael Haley's "An Evolution in Intelligence Doctrine: The Intelligence, Surveillance, and Reconnaissance Mission Type Order."

¹⁴For information regarding unit and flight hour cost for F/A-18 see: http://www.navy.mil/navydata/fact_print.asp?cid=1100&tid=1200&ct=1&page=3, for F-15 information: http://www.af.mil/information/factsheets/factsheet_print.asp?fsID=101&page=5, 20 December 2012.

¹⁵ <http://www.bga-aeroweb.com/Defense/RQ-7-Shadow.html>

¹⁶ <http://www.bga-aeroweb.com/Defense/MQ-1-Predator-MQ-9-Reaper.html>

¹⁷ U.S. Department of Defense, *Joint Intelligence*, JP 2-0, I-21.

¹⁸ Michael L. Downs, “Rethinking the CFACC’s Intelligence, Surveillance, and Reconnaissance Approach to Counterinsurgency,” (Newport, RI: Naval War College, 2007), 11.

¹⁹ Ibid.

²⁰ U.S. Department of Defense, *Commander’s Handbook for Persistent Surveillance*, (Suffolk, VA: Joint Warfighting Center, 2011), I-3.

²¹ John A. Tirpak, “Find, Fix, Track, Target, Engage, Assess,” (Arlington, VA: Air Force Magazine, July 2000), 24.

²² Email from LtCol Ché “Curly” Bolden, Commanding Officer, Marine Unmanned Aerial Squadron 2, 25 January 2013.

²³ Mark A. Cooter, “Airborne Armed Full Motion Video: The Nexus of OPS/INTEL Integration in the Joint/Coalition Environment,” (Norfolk, VA: Joint Forces War College, 2007).

²⁴ Email from LtCol Kevin “Astro” Murray, Commanding Officer, Marine Unmanned Aerial Squadron 1, 10 January 2013.

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